NOAA Technical Memorandum NMFS-SEFSC-608

# TRENDS IN THE SOUTH ATLANTIC GOLDEN CRAB FISHERY

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This report should be cited as follows:

Crosson, Scott B. 2010. Trends in the South Atlantic Golden Crab Fishery. NOAA Technical Memorandum NMFS-SEFSC-608.

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## Abstract

This report reviews available economic data for the golden crab fishery in the area under the jurisdiction of the South Atlantic Fishery Management Council since the inception of active management. Landings, participation rates, and fishing effort are described and tracked using data from the logbook program as managed by the Southeast Fisheries Science Center. Ex-vessel value and information on participation in other fisheries is provided using data from the trip ticket program as administered by the State of Florida.

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# 1. Introduction

The golden crab (*Chaceon fenneri*) is a crustacean that is fished in deep (greater than 500 feet) water off the southeastern United States coast. The fishery has been managed by the South Atlantic Fishery Management Council under the Golden Crab Fishery Management Plan (FMP) since 1996. The Plan has been amended four times and the Council is currently developing Amendment Five, with a catch share program the primary management change under consideration. The fishery is relatively small and localized, with all recent landings occurring in the state of Florida. There was no statement of Maximum Sustained Yield (MSY) in the original stock assessment due to lack of data, although estimates based on habitat and stocks in the Eastern Gulf of Mexico provided MSY estimates from 69,658 lbs to 1,648,611 lbs (Harper and Scott 1998).

The stock status was last assessed in 2000, at which time golden crab was not overfished and overfishing was not occurring (Harper et al 2000). Estimates of MSY at 673,000 lbs per year were provided. The Council rejected this estimate and approved an MSY of 4 to 12 million pounds in Amendment 3. Reports from the National Marine Fisheries Service in 2003 and 2004 reiterated that golden crab was not overfished and overfishing was not occurring, and that combining the original MSY estimates with those of Harper et al indicated an MSY of between 1.5 and 2.5 million pounds (National Marine Fisheries Service 2004). However, as of 2008, the stock status has been shifted to "unknown" (Hagedorn 2009). Golden crabs are also native to the Bahamas, but there is no known golden crab fishery being prosecuted in those waters.
The object of this report is to provide an overview of the current status of the commercial fishery for golden crab. Because the FMP divides the fishery into three zones, and because the number of vessels involved has never exceeded 11 (and in some years, less than half that), much of the data for the fishery is confidential. This report will hence provide as much summary data as possible and illustrate trends. Golden crab fishermen have not been surveyed by NOAA and there is no economic expenditure data on which a business model could be built.

## 2. Landings

The fishery is executed in deep water using traps baited with fish head or other processing by-product, with 20 to 50 traps per line. Fishermen may deploy and retrieve traps for several days. Trap lines are typically set adjacent to deep coral reefs, and must be retrieved using GPS coordinates rather than buoys due to the strong currents of the Gulf Stream, with each line taking approximately two hours to work. Only males are harvested and are immediately iced after being brought aboard (South Atlantic Fishery Management Council 2010). There is no information on females being discarded after being brought on board, but fishermen consider the escape gaps on both sides of the trap to be very effective in allowing undersized males and the generally-smaller females to escape before traps are brought up from the bottom.
Landings in the fishery since the inception of the FMP have fluctuated from a high of 1,034,000 lbs in 1997 to a low of 278,000 lbs in 2004. There has not been any long term trend evident, though, as landings in recent years have rebounded from that 2004 low and trended up towards earlier peaks (Figure 1).


**Figure 1. Pounds landed of golden crab in the South Atlantic (source: Logbook Program).**

## 3. Fishing Effort

The number of golden crab-landing trips has also increased in recent years. The peak was 245 trips in 1997, followed by a general decline. Only 60 trips were taken in 2004, but more than triple that amount (197) were taken in 2009 (Figure 2). Pounds of golden crab landed (left y-axis) are heavily correlated with the number of trips taken (right y-axis). As noted above, participation in the fishery has been low, with only a handful of boats active in any given year since the implementation of the FMP[1]. In 2009, six boats participated in the fishery.

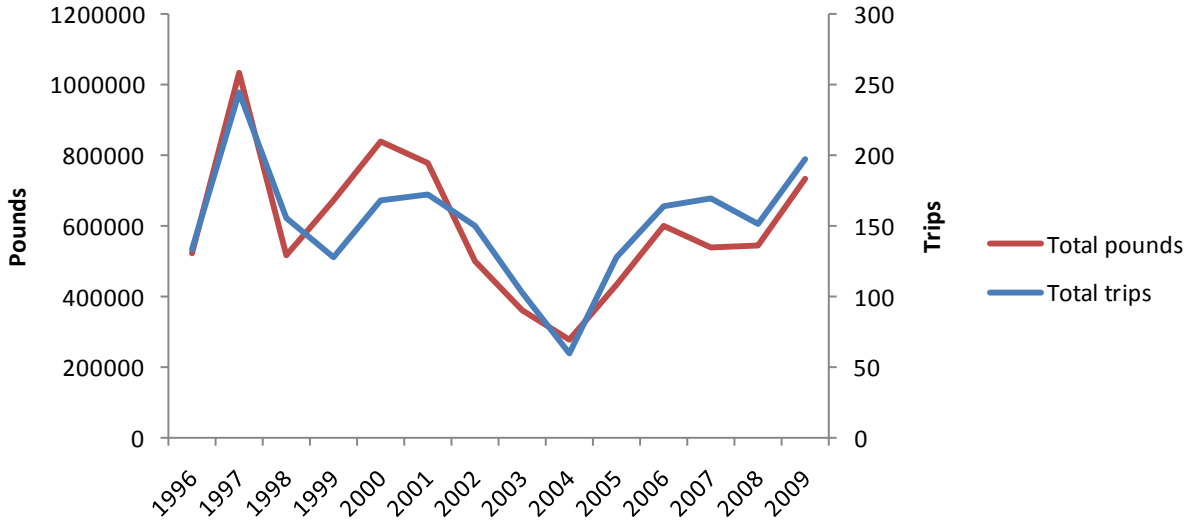


**Figure 2. Golden crab-landings trips in the South Atlantic (source: Logbook Program).**

Overall production from the fishery is also closely correlated with the number of traps pulled, as shown in Figure 3. Total pounds are tracked on the left y-axis, and the number of traps is tracked on the right y-axis. Total pounds landed and the number of traps pulled peaked in 1997 and then again in 2000. Both the number of traps pulled and total pounds landed dipped from the high in 2000 (over 25,000 traps were deployed that year for landings of 840,000 pounds) to a low in 2004 (where 5,300 traps were deployed for landings of 280,000 pounds). Both have climbed back towards their earlier highs since 2004.

[1] See Table 1 for these and other numbers on catch and effort. All tables are located after the narrative.


**Figure 3. Number of traps pulled and total landings (source: Logbook Program).**

Figure 4 illustrates the trends in trap deployment for average fishing trips for golden crabs. The average number of sets deployed on a trip has remained close to constant, varying slightly between 1.8 and 3.1 sets per trip (right y-axis). The average number of traps per set (left y-axis) has also fluctuated within a range from 36 to 53, and since 2007 has hovered around 45 traps.

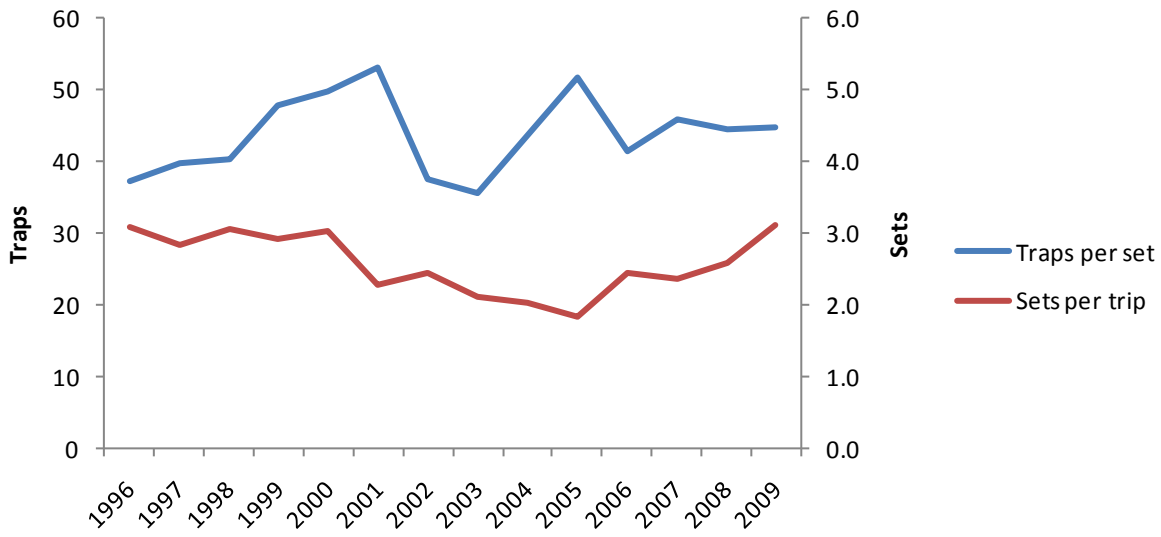


**Figure 4. Average traps per set and sets per trip (source: Logbook Program).**

Figure 5 shows that most trips (y-axis) are now deploying and pulling more than 75 traps.

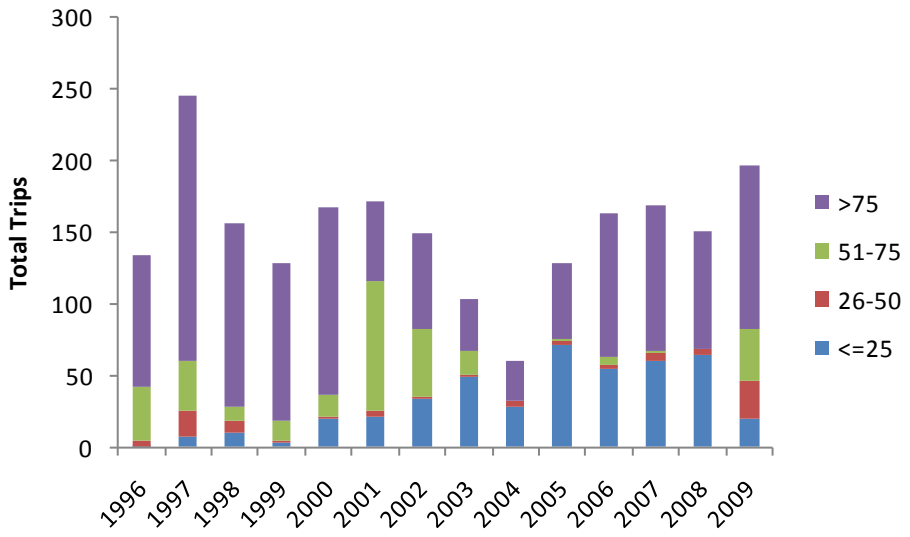


**Figure 5. Number of traps pulled per trip (source: Logbook Program).**

The average depth fished has increased since 2005, and the number of traps per trip has increased as well. These trends are shown in the primary and secondary Y-axes in Figure 6. The average haul depth is now close to 1800 feet, up from 1200 feet in 1996.

However, this shift has corresponded with a shift in effort southward, where the drop off into deep water is closer and where geographic factors may limit crab density.

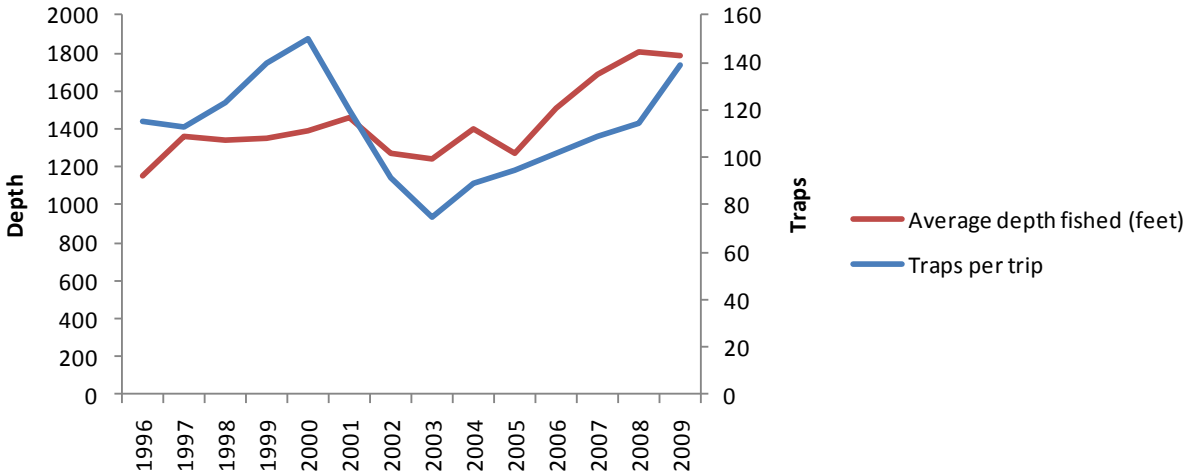


**Figure 6. Annual average depths and production of traps (source: Logbook Program).**

Trips are taken throughout the year, as shown in Figure 7, with the largest percentage of trips taken in the late spring and early summer months.

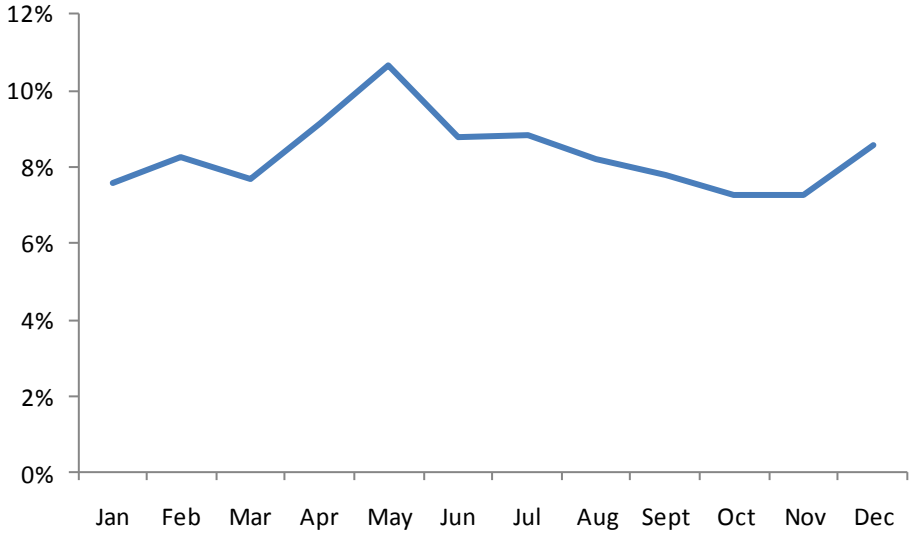


**Figure 7. Percent of annual trips taken per month, 1996-2009 (source: Logbook Program).**

## 4. Revenues

Figure 8 illustrates that the ex-vessel price of golden crab rose substantially between 2000 and 2009, irrespective of fluctuations in landings. The ex-vessel price rose from $1.15 to $1.72, an increase of 50%; the consumer price index rose 25% during the same time period. The 2004 SAFE Report noted that golden crab prices were heavily dependent on the market for frozen snow crab, with which it competes.

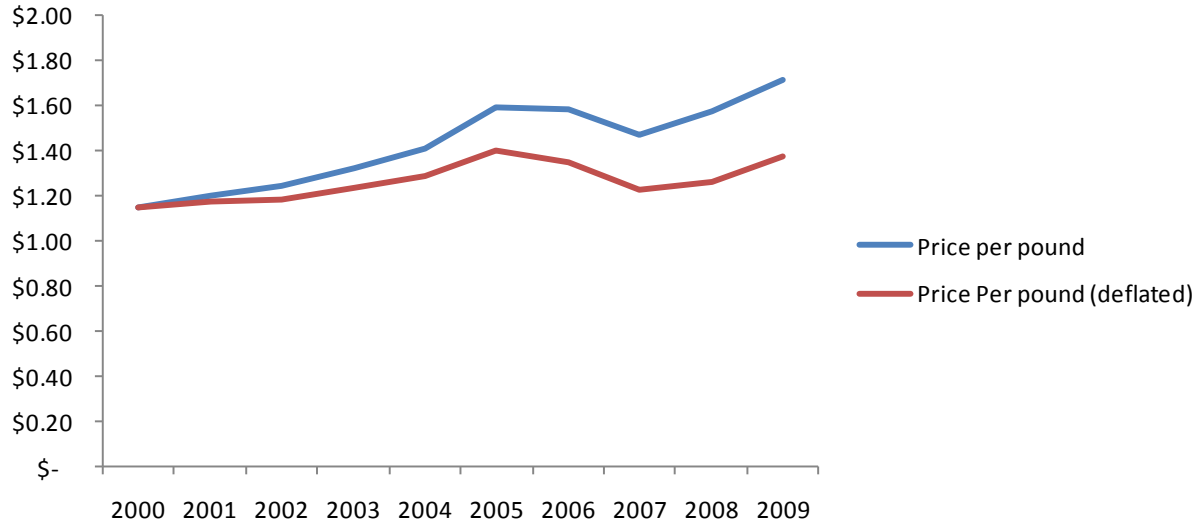


**Figure 8. Nominal and deflated price of golden crab (source: Florida Trip Ticket Program).**

General revenues have gone up during that time, as shown in Figure 9. After a low of $400,000 in 2004, fleet revenues are now approaching $1.4M annually.

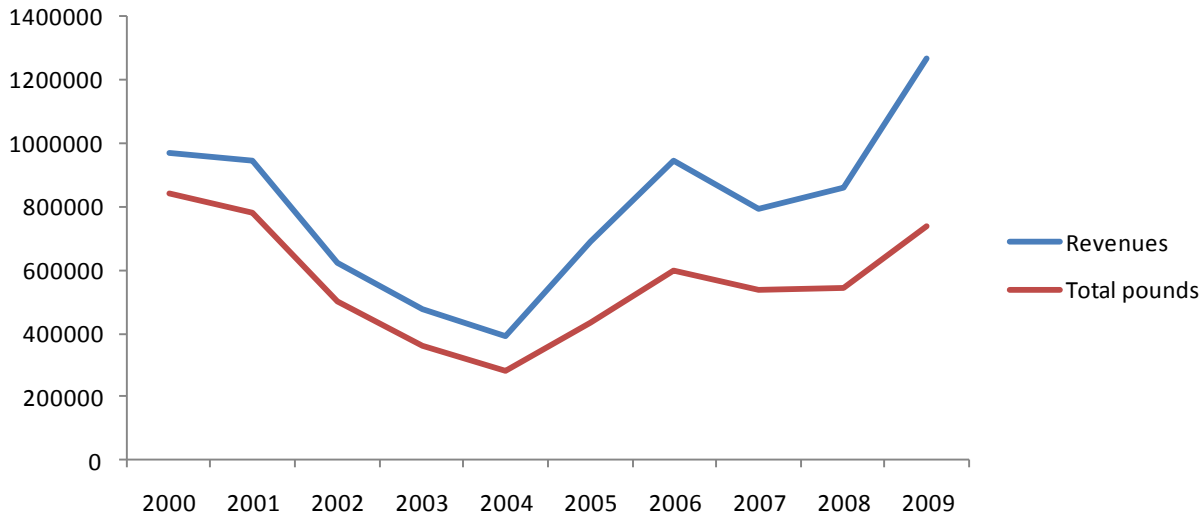


**Figure 9. Revenues and pounds landed of golden crab, 2000-2009 (sources: Logbook Program, Florida Trip Ticket Program).**

## 5. Productivity

The number of pounds per trip is closely correlated with the number of traps deployed, as might be expected. This relationship is shown in Figure 10. Trip poundage is marked using the left Y-axis; traps per trip is indicated on the right Y-axis.

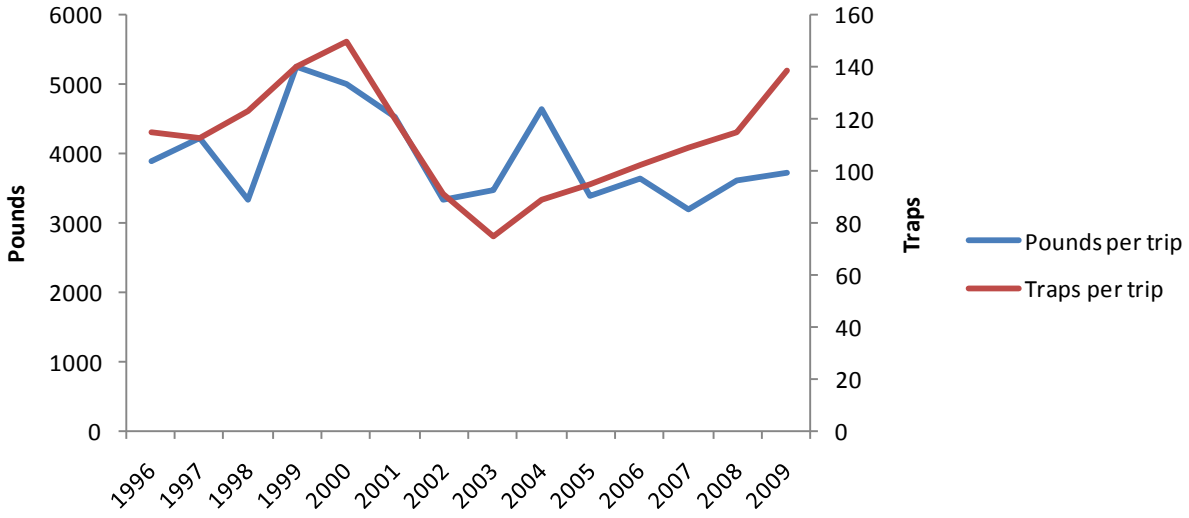


**Figure 10. Pounds and traps per trip of golden crab harvest, 1996-2009 (source: Logbook Program).**

In contrast, the number of pounds landed per trap is generally inversely correlated with the number of traps deployed, especially since 2002, as seen in Figure 11. The number of deployed traps is marked using the left Y-axis; pounds per trip is indicated on the right Y-axis.

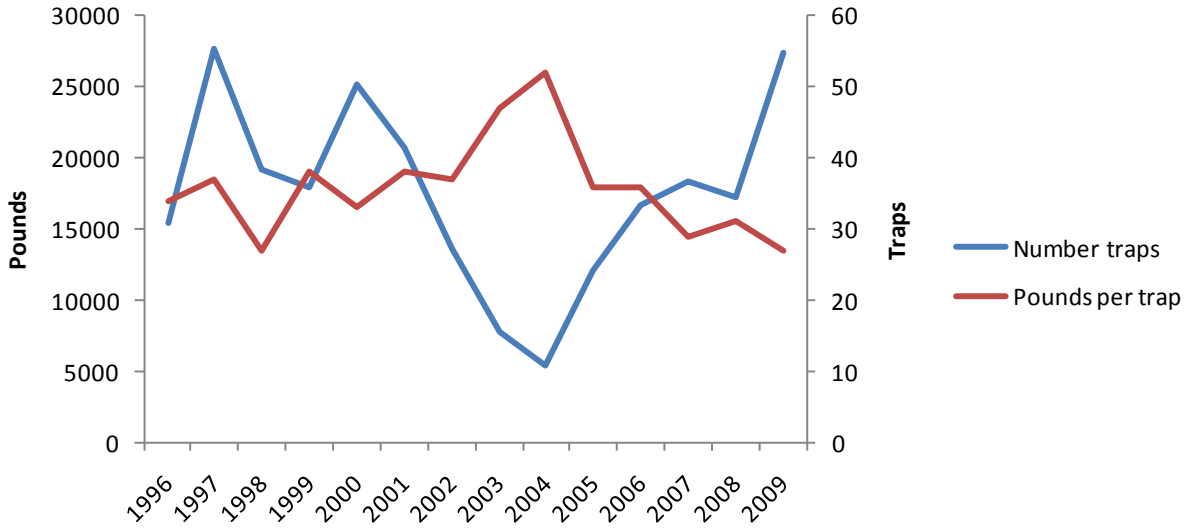


**Figure 11. Traps and pounds per trap of golden crab harvest, 1996-2009 (source: Logbook Program).**

The increase in the price of crabs has meant that even though the number of pounds per trip has generally leveled off since 2005, revenues per trip have risen, as shown in Figure 12.

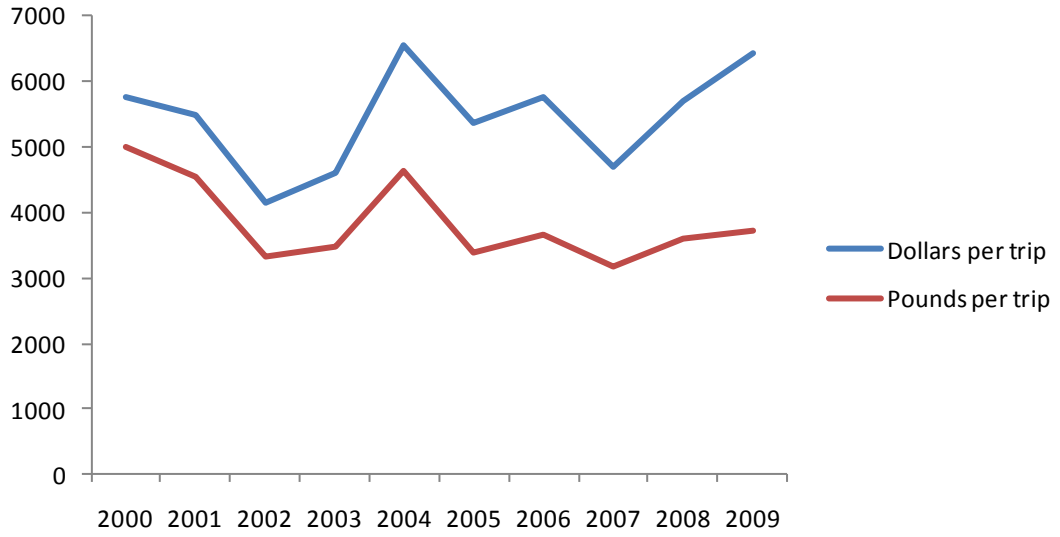


**Figure 12. Revenues and pounds per trip of golden crab harvest, 2000-2009 (source: Logbook Program, Florida Trip Ticket Program).**

## 6. Participation in Other Fisheries

The boats involved in the golden crab fishery are specialized, but do not exclusively land golden crab, and may take trips to land other species as well. Since 2007, however, none of the boats has taken a trip exclusively for other species in the same year they were involved in the golden crab fishery (Figure 13). A few boats are specializing and are now exclusively targeting golden crabs, while the remaining boats have moved into other fisheries.

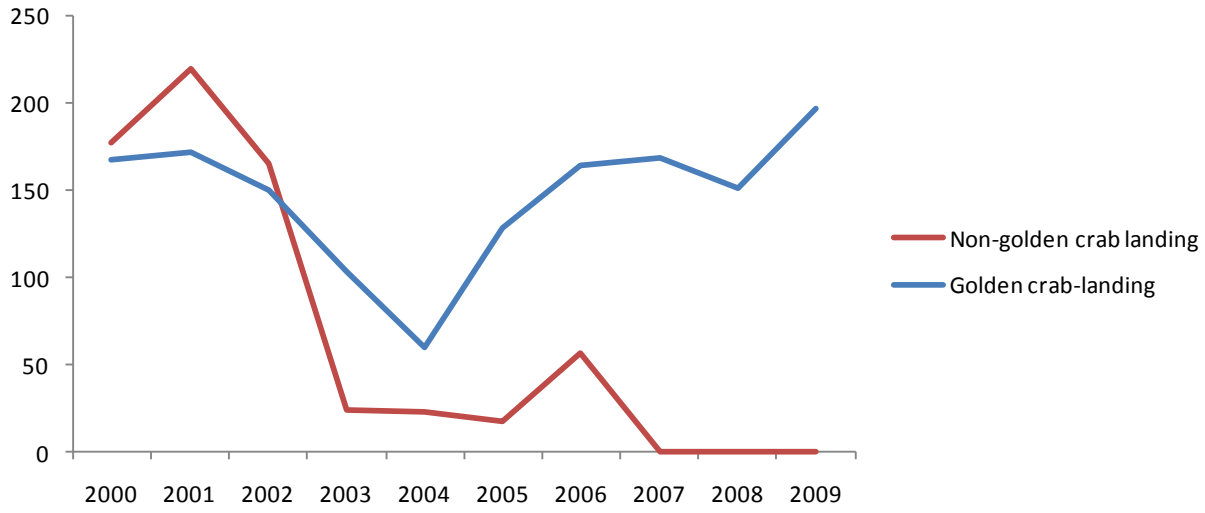


**Figure 13. Trips taken by active boats (source: Florida Trip Ticket Program).**

Where have these boats been utilized when not active in the golden crab fishery? Figure 14 lists the top species landed by boats involved at any point in the golden crab fishery from 2000-2009. Few of these boats were active in golden crab in every single year. Almost half of the value landed by these boats during that time came from golden crab, but they also participated in the spiny lobster, stone crabs, snapper/grouper[2], and king/cero mackerel fisheries. Boats no longer in the golden crab fishery, or that may leave the fishery in the future, are most likely to end up in one of these alternatives.

[2] As managed by the South Atlantic Council. Includes snappers, groupers, triggerfish, grunts, porgies, and jacks.

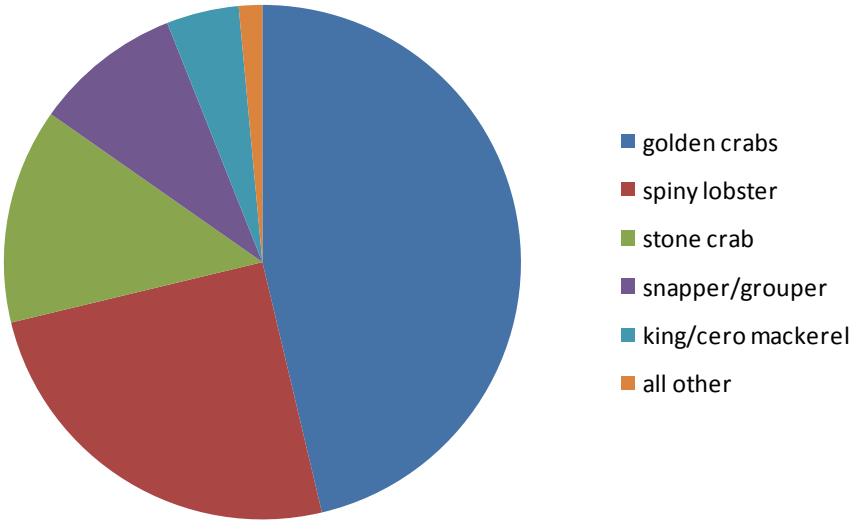


**Figure 14. Percent of total value of all species landed by all permitted boats active in the golden crab fishery at any point from 2000-2009 (source: Florida Trip Ticket Program).**

They are mostly still active on the east coast of Florida under the jurisdiction of the SAFMC, however. The golden crab fishery is broken into three regulatory areas by the South Atlantic Fishery Management Council. The designated fishing zones are as follows:

1. Northern zone: the South Atlantic EEZ north of 28 degrees N. lat.
2. Middle zone: the South Atlantic EEZ from 25 degrees N. lat. to 28 degrees N. lat.
3. Southern zone: the South Atlantic EEZ south of 25 degrees N. lat.

The Northern Zone roughly runs from West Palm Beach northward, with the Middle Zone extending from its border below Miami. The Southern Zone is the Florida Keys area. Boats involved with the golden crab fishery have generated most of their fishing income from the Middle and Southern Zones, followed by landings from the West Coast of Florida and Northern Zone, with occasional landings from other areas (primarily state waters) accounting for the rest (Figure 15).

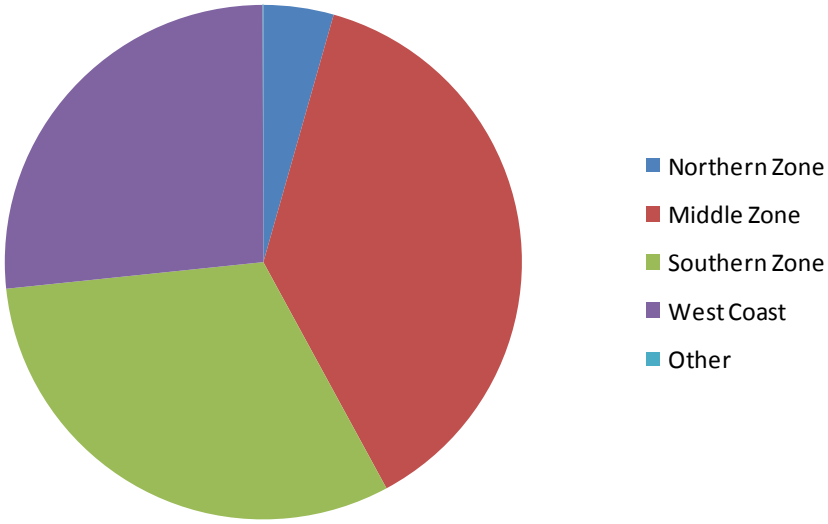


**Figure 15. Percent of total value of all regions by permitted boats active in the golden crab fishery at any point from 2000-2009 (source: Florida Trip Ticket Program).**

## 7. Marketing

Golden crab has not had a strong market identity, even locally (although there are indications that is changing, as local sales rose in 2009). It has primarily acted as a substitute for other species of crabs when regional supplies of those products have been unable to meet demand. Since the origin of the FMP, golden crab has been purchased for sale on the West Coast of the United States when dungeness crab harvests have been low (in the early part of the 2000s). They have also been sold in the Northeast for use in the crab buffet market when snow crab supplies from Canada were insufficient (more recently). They have also been exported to East Asia and occasionally Las Vegas to satisfy a high-end live market for Australian crystal crab, a distant relative to which it bears a strong resemblance. In many of these cases, the golden crab is sold under the name of the competing species (personal communication, Randy Manchester).

## 8. Outlook

Given the consistent ex-vessel price of the species irrespective of landings, it is unlikely that landings declined during the mid-2000s due to a saturation of the commercial market. Golden crab-landing fishermen (Whipple and Rau 2009) attributed the decline and resurgence of the fishery as due to two key factors:

1. the difficulty of prosecuting a deepwater fishery in the middle of the Gulf stream, and
2. the difficulty in bringing live crabs to market.

Mortality has traditionally been high as the deepwater species is brought up from the depths, and fishermen have tried with limited success to preserve the crabs by immersing them in ice. Whipple and Rau (2009) note that "after 72 hours on ice, nearly 30% of deepwater crabs will die. In six days, less than 20% will be alive."

They continue by noting that the recent introduction of refrigerated seawater systems on harvesting vessels has nearly eliminated the post-landing mortality issues, and the fishery will potentially expand with the new technology.

**Table 1. Landings of golden crab in the south Atlantic, all regions 1996-2009 (Sources: Logbook Program, Florida Trip Ticket Program, Accumulated Landing Series).**

| Year | Dealers | Vessels | Number Trips | Number Sets | Number Traps | Total Pounds | Revenues |
|---|---|---|---|---|---|---|---|
| **1996** | 3 | 3 | 134 | 413 | 15375 | 523160 | $455,149 |
| **1997** | 11 | 11 | 245 | 695 | 27703 | 1034447 | $931,002 |
| **1998** | 9 | 9 | 156 | 476 | 19205 | 518316 | $471,668 |
| **1999** | 5 | 5 | 128 | 374 | 17876 | 673519 | $707,195 |
| **2000** | 7 | 8 | 168 | 507 | 25192 | 841747 | $968,009 |
| **2001** | 5 | 5 | 172 | 390 | 20683 | 781138 | $945,177 |
| **2002** | 6 | 6 | 150 | 365 | 13687 | 500774 | $620,960 |
| **2003** | 5 | 7 | 103 | 217 | 7720 | 359087 | $473,995 |
| **2004** | 4 | 5 | 60 | 122 | 5341 | 278336 | $392,454 |
| **2005** | 4 | 8 | 128 | 234 | 12136 | 432846 | $688,225 |
| **2006** | 5 | 7 | 164 | 403 | 16680 | 599374 | $947,011 |
| **2007** | 4 | 4 | 169 | 400 | 18361 | 538432 | $791,495 |
| **2008** | 5 | 5 | 151 | 389 | 17305 | 544256 | $859,924 |
| **2009** | 6 | 6 | 197 | 612 | 27355 | 735589 | $1,265,213 |

**Table 2. Productivity measures of golden crab harvest in the south Atlantic, all regions 2000-2009 (Logbook Program and Florida Trip Ticket Program).**

| Year | Number Trips | Number Traps | Pounds/Trip | Pounds/Trap | $/Trip | $/Trap | Traps/Trip |
|---|---|---|---|---|---|---|---|
| **2000** | 168 | 25192 | 5010 | 33 | $5,762 | $38 | 150 |
| **2001** | 172 | 20683 | 4542 | 38 | $5,495 | $46 | 120 |
| **2002** | 150 | 13687 | 3338 | 37 | $4,140 | $45 | 91 |
| **2003** | 103 | 7720 | 3486 | 47 | $4,602 | $61 | 75 |
| **2004** | 60 | 5341 | 4639 | 52 | $6,541 | $73 | 89 |
| **2005** | 128 | 12136 | 3382 | 36 | $5,377 | $57 | 95 |
| **2006** | 164 | 16680 | 3655 | 36 | $5,774 | $57 | 102 |
| **2007** | 169 | 18361 | 3186 | 29 | $4,683 | $43 | 109 |
| **2008** | 151 | 17305 | 3604 | 31 | $5,695 | $50 | 115 |
| **2009** | 197 | 27355 | 3734 | 27 | $6,422 | $46 | 139 |

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